

WHAT IS CLAIMED IS:

1. An image processing apparatus, comprising:
 - a wavelet transform unit to perform compression encoding in a hierarchical manner by performing discrete wavelet transform on pixel values for each of one or more rectangular regions dividing image data;
 - a digital watermark obtaining unit to obtain digital watermark data to be embedded into wavelet coefficients generated by the wavelet transform unit;
 - a characteristics extracting unit to extract characteristics of the wavelet coefficients for each of the rectangular regions;
 - an embedding specification determination unit to determine an embedding specification of the digital watermark data with respect to the wavelet coefficients in accordance with the characteristics of the wavelet coefficients for each of the rectangular regions that are extracted by the characteristics extracting unit; and
 - a digital watermark embedding unit to embed into the wavelet coefficients the digital watermark data for each of the rectangular regions in accordance with the embedding specification of each of the rectangular regions determined by the embedding specification determination unit.
2. The image processing apparatus as claimed in claim 1, wherein the embedding specification determination unit determines an embedding intensity of the digital watermark data with respect to the wavelet coefficients of each of the rectangular regions in accordance with frequency components included in each of the rectangular regions.
3. The image processing apparatus as claimed in claim 1, wherein the embedding specification determination unit determines an embedding intensity of the digital watermark data with respect to the wavelet coefficients of each of the rectangular regions depending on

whether each of the rectangular regions includes a ROI (region of interest).

4. The image processing apparatus as claimed in claim 1, wherein the embedding specification determination unit determines an amount of embedding information of the digital watermark data with respect to the wavelet coefficients of each of the rectangular regions in accordance with frequency components included in each of the rectangular regions.

5. The image processing apparatus as claimed in claim 1, wherein the embedding specification determination unit varies, for each of the rectangular regions, a subband that becomes a target into which the digital watermark data are embedded.

6. The image processing apparatus as claimed in claim 1, wherein the embedding specification determination unit varies, for each of the rectangular regions, wavelet coefficients that become targets into which the digital watermark data are embedded.

7. An article of manufacture comprising one or more recordable media having a program that is installed on or interpreted by a computer, which when executed by the computer, causes the computer to perform a method comprising:

performing compression encoding in a hierarchical manner by performing discrete wavelet transform on pixel values for each of one or more rectangular regions dividing image data;

obtaining digital watermark data to be embedded into wavelet coefficients generated by the wavelet transform unit;

extracting characteristics of the wavelet coefficients for each of the rectangular regions;

determining an embedding specification of the digital watermark data with respect to the wavelet coefficients in accordance with the characteristics of the wavelet coefficients for

each of the rectangular regions that are extracted by the characteristics extracting unit; and
embedding into the wavelet coefficients the digital watermark data for each of the
rectangular regions in accordance with the embedding specification of each of the rectangular
regions determined by the embedding specification determination unit.

8. An article of manufacture comprising one or more recordable media having a
program that is installed on or interpreted by a computer, which when executed by the
computer, causes the computer to perform a method comprising:

performing compression encoding in a hierarchical manner by performing discrete
wavelet transform on pixel values for each of one or more rectangular regions dividing image
data;

obtaining digital watermark data to be embedded into wavelet coefficients generated
by the wavelet transform unit;

extracting characteristics of the wavelet coefficients for each of the rectangular
regions;

determining an embedding specification of the digital watermark data with respect to
the wavelet coefficients in accordance with the characteristics of the wavelet coefficients for
each of the rectangular regions that are extracted by the characteristics extracting unit; and

embedding into the wavelet coefficients the digital watermark data for each of the
rectangular regions in accordance with the embedding specification of each of the rectangular
regions determined by the embedding specification determination unit.

9. An image processing apparatus, comprising:

a characteristics extracting unit to extract characteristics of wavelet coefficients of
one or a plurality of rectangular regions dividing an image;

an embedding specification determination unit to determine, in accordance with the
extracted characteristics of the wavelet coefficients for each rectangular region, an

embedding specification of digital watermark data with respect to the wavelet coefficients;
and

a digital watermark embedding unit to embed the digital watermark data into the wavelet coefficients for each rectangular region in accordance with the embedding specification of each rectangular region.

10. The image processing apparatus as claimed in claim 9, wherein the characteristics of wavelet coefficients extracted by the characteristics extracting unit is based on the frequency components included in each of the rectangular regions.

11. The image processing apparatus as claimed in claim 10, wherein when a rectangular region includes a lot of high frequency components, the embedding specification determination unit determines that the embedding specification of the digital watermark data with respect to the wavelet coefficients is a strong embedding intensity.

12. The image processing apparatus as claimed in claim 10, wherein when a rectangular region includes a lot of high frequency components, the embedding specification determination unit determines that an amount of embedding information of the digital watermark data is heavy.

13. The image processing apparatus as claimed in claim 12, wherein the amount of embedding information of the digital watermark data is varied.

14. The image processing apparatus as claimed in claim 9, wherein the characteristics of wavelet coefficients extracted by the characteristics extracting unit is based on whether the rectangular region includes a region of interest (ROI).

15. The image processing apparatus as claimed in claim 14, wherein when a rectangular region includes a ROI, the embedding specification determination unit determines that the embedding specification of the digital watermark data with respect to the wavelet coefficients is a strong embedding intensity.

16. The image processing apparatus as claimed in claim 9, wherein a subband of each rectangular region that becomes the target into which the digital watermark data are embedded may be varied for each rectangular region.

17. An article of manufacture comprising one or more recordable media having a program that is installed on or interpreted by a computer, which when executed by the computer, causes the computer to perform a method comprising:

extracting characteristics of wavelet coefficients of one or a plurality of rectangular regions dividing an image;

determining, in accordance with the extracted characteristics of the wavelet coefficients for each rectangular region, an embedding specification of digital watermark data with respect to the wavelet coefficients; and

embedding the digital watermark data into the wavelet coefficients for each rectangular region in accordance with the embedding specification of each rectangular region.